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U. S. DEPARTMENT OF THE INTERIOR
National Park Service

# Firehole Lake Area, Self-Guiding Nature Trail
# Yellowstone National Park

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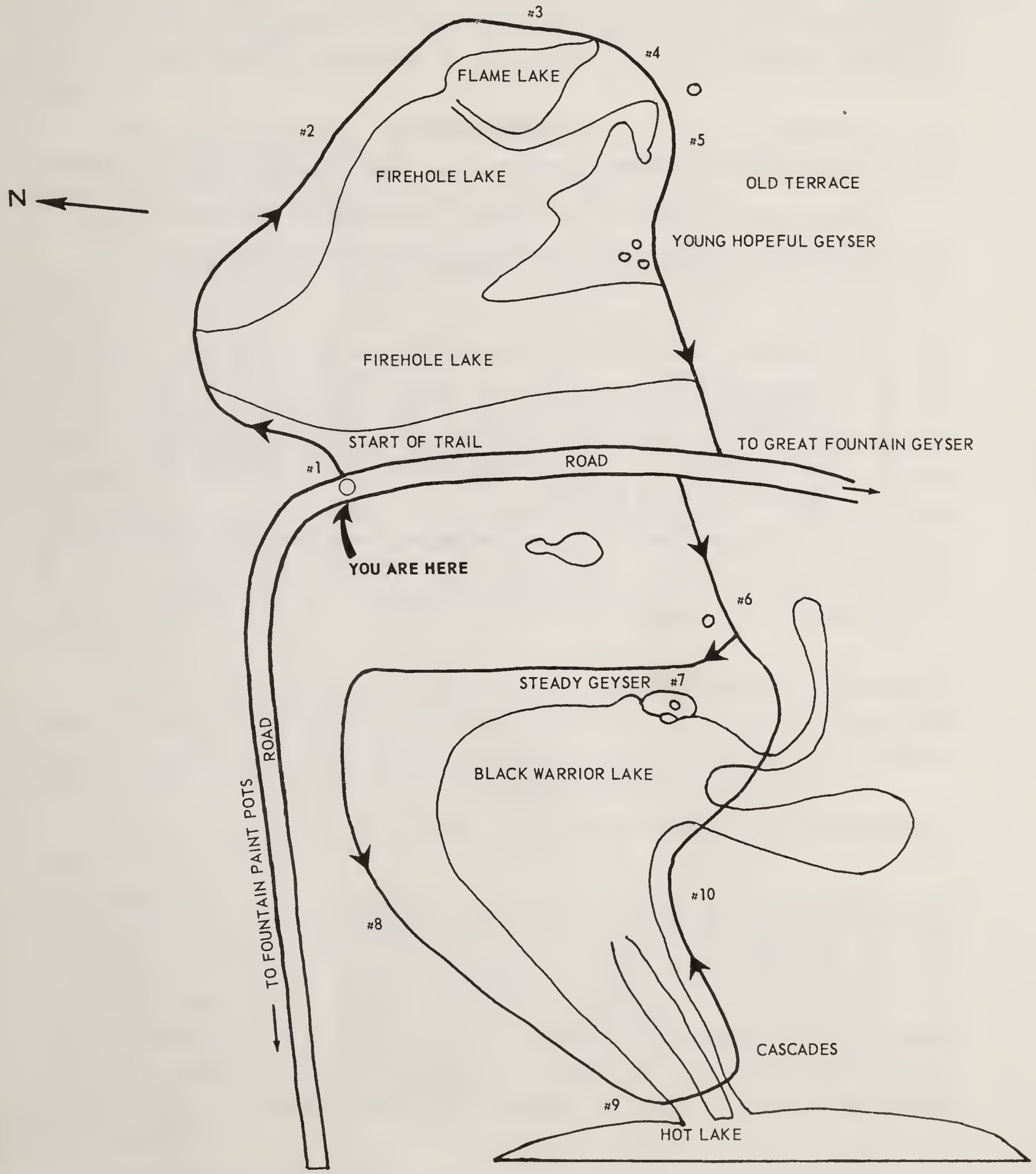

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The above sketch shows the Hot Springs covered by this Trail.

## WELCOME

This is *YOUR* Yellowstone—the oldest National Park in the United States (1872), the largest, and one of the most popular parks in which American families spend their vacation time.

The National Park System, of which this park is a unit, is dedicated to conserving the scenic, scientific, and historic heritage of the United States for the benefit and enjoyment of its people.

# SELF-GUIDING NATURE TRAIL, FIREHOLE LAKE AREA NATIONAL PARK SERVICE

Yellowstone's famous and unique hot springs belong to you. Help the National Park Service preserve their beauty and unspoiled character.

STAY ON THE BOARDWALKS. THEY ARE A MEANS OF PROTECTION TO YOU AND THE FORMATIONS.

The self-guiding trail starts here.

**STATION 1** — Firehole Lake is but one of a series of 4 small lakes that owe their origin to hot water. These lakes lie in a generally east-west direction. The magnitude of their discharge is one of their most significant characteristics. The steady flow of water amounts to about 8 second feet. Expressed in gallons this equals 3600 gallons per minute.

In a number of places in the geysers basins surface cracks appeared as a result of the 1959 earthquake. These cracks or rifts were much more extensive here than in any other section of the thermal areas. Crisscrossing cracks, with no definite pattern of alignment, traversed the ground about all of the Firehole Lakes. Measurements of these cracks indicated that if they were in one straight line the distance would be close to two miles.

Not only was the ground badly broken by the quake, but much slumping and altering in surface topography occurred. This does not mean that the jarrings were necessarily more severe here than in other sections of the geyser basins, the more extensive broken ground resulted from the nature of the deposits and the high porosity of the ground. Numerous cracks will be evident along the course of the trail.

Firehole Lake is very irregular in outline. Its configuration underwent a marked change as a result of the 1959 earthquake. On the morning following the quake the water was very murky and all flow had ceased. It soon became apparent that the absence of discharge had resulted from the lake being depressed on the side next to the hill. Numerous cracks had formed in this area, into some of which the water was flowing. As these cracks filled with sediments the lake began discharging to the left, directly ahead.

Formerly this was grass cover. The overflow going under the walks is now draining into a crack caused by the quake.

Midway between this point and the sign on the hillside you can observe on the right of the walk where the old foot path skirted the side of the lake. Sections of this path are now covered with water, indicating the slumping or depressed ground referred to.

**STATION 2**—Note the large earthquake-caused cracks. These cracks circle this end of Firehole Lake. The shoulder of the lake along this side slumped several inches. The deepest part of the lake is in this section. The temperature is quite variable, depending upon whether it is taken over a hot spring. They are numerous on the bottom. Regardless of light conditions the water looks very dark. This is due to the almost jet-black sediments. White objects in the bottom of the lake appear blue.

**STATION 3**—This large spring, Flame Pool, is separate from Firehole Lake. Its water pours over a ledge into Firehole Lake. Its area is about 10 by 18 yards. The temperature at the point where you see the ascending gas bubbles is 176 degrees. One of the principal sources of the water for Flame Pool is the bubbling spring in the far end, next to the walk. Its temperature is 199 degrees, which is boiling at this elevation.

Firehole Lake's main claim for distinction results from what looks like a flickering blue flame. It is continually fluctuating in form, yet always preserves the same general appearance. The effect is due to large bubbles of volcanic gas rising through the water. The gas bubbles appear blue because of selective absorption of light rays by the water.

Due to the earthquake, and the necessary replacement of the walk, the main point at which the gas bubbles rise in Firehole Lake cannot be seen. However, you can see this same flame-like effect in Flame Pool when the day is warm and relatively calm. From a number of points in the bottom of the spring the gas bubbles are continually rising.

Observe how part of the old foot path dropped to lake level.

**STATION 4**—The extension of ground, or peninsula, separating Flame Pool from Firehole Lake was badly rifted by the quake. A new spring is gurgling from the crack near the pool. The walk at this point is over a cracked and slumped embankment.

Above this embankment, farther up the gulch, a number of cracks caused by the quake resulted in the formation of new steam vents.

**STATION 5**—The heavily flowing springs near the walk have temperatures of 199 degrees. The one on the left was stimulated into eruptive activity by the quake, boiling steadily to heights of 3 to 4 feet. This activity continued for several weeks before it changed to the present steady flow.

The outcropping, dark colored rock to the left of the walk is a part of an old hot spring terrace. These terraces extend up the ravine for at least 200 yards.

The deposits of the terraces have no counterpart in the Lower Geyser Basin. They consist largely of calcium carbonate (lime), rather than silicious sinter (geyserite), which is the principal mineral deposited by the geysers. The conditions which gave rise to these terraces have passed away, but the hot water in this area still continues to deposit lime. Present day deposits, however, contain an abundance of silicious sinter. The later, as well as the older deposits contain about 1.0 percent manganese. This is what gives the dark color to the terrace. The red incrustation is due to lichens which are members of the plant family. Yellow mimulus, or monkey flowers, bloom profusely here at times.

One of the small craters ahead on the right of the walk was named Young Hopeful in 1871 by a U. S. Geological Survey party. It has been dormant for a number of years. No activity was stimulated by the earthquake.

Cross the road and take the lower walk for a continuation of this trail.

**STATION 6**—This spring and many sections of ground in this area show objectively the desirability of staying on the constructed walks. Some springs build thin extensions of mineral out over their craters, making it hazardous to approach too near the edge. In other instances the ground becomes soft and decomposed near hot-spring openings, permitting a cavernous extension of the crater, as with this spring.

Go to the right.

**STATION 7**—Steady Geyser is to the left of the walk. It has also been known as the Black Warrior. Its mound is on the edge of a small lake. It has two vents. One is at the top of the mound, the other, the spouting one, is on the side bordering the lake.

Prior to 1959 the Steady Geyser action came from the top vent, the one now dormant. Water jetted from it constantly to heights ranging between 20 and 30 feet. Occasionally the side vent played in concert. With cessation of play from the top vent the side vent has become the steady geyser.

The side vent is not playing as high as did the former Steady Geyser. This in part may have resulted from the quake. That the geyser's underground plumbing might have been altered by the quake is indicated by several cracks which cross the mound. The severe fracturing of the mound might be a factor in complete cessation of discharge of the top vent.

Steady play of water from a hot spring does not fully meet the definition of a geyser. To be a true geyser the action must be intermittent, or periodic. It is necessary that quiet periods intervene between boiling periods.

The large spring to the right, in the direction of Firehole Lake, underwent a marked change the night of the earthquake. It had formerly been a steadily overflowing spring with a temperature of 200 degrees. It had never been known to erupt. The quake not only badly broke the geyserite shoulders about this spring, it induced a big eruption. Since this eruption there has been no further eruptive activity or overflow. Its temperature is now 172 degrees.

The Firehole Lake area is characterized by having very few geysers, yet the night of the earthquake 12 of its springs erupted. For 10 of them there is no record of any previous geyser function. Most of these erupting springs were in the flat directly ahead across the road. The ground in this area underwent marked slumping.

Frequently there are rather dense steam clouds blowing across the walk directly ahead. Watch your step. The steam is not hot.

**STATION 8**—Note how the water has receded from the old shore line, exposing the manganese tinted geyserite. This would seem to indicate less discharge than before the quake, which is not the case. The shore near the walk is dry due to a slight emergence of the surface. Some of the surface structure in the Firehole Lake area is now in the form of swells and swales.

The reddish, leathery appearing scum is due to hot water algae. Most of the red, yellow and brown hues observed in the hot springs and their runoff channels are due to these primitive plants. Do not mistake it for mineral coloration.

**STATION 9**—It is not often that cascades of hot water can be observed in nature. Here is a unique situation. Yellowstone not only has hot-water cascades, there is at least one hot-water fall. The temperature of these cascades is 165 degrees. The water flows into Hot Lake on the right.

Hot Lake is the largest body of hot water in the Park. It is irregular in outline and is approximately 110 by 290 yards in area. Its temperature along the east shore, the shore toward Firehole Lake, is 148 degrees. It is near 100 degrees at the outlet. Occasionally geese and ducks will alight on this body of water. Geese have been known to nest on the far side.

**STATION 10**—The small lake into which Steady Geyser is discharging is known as Black Warrior Lake. There are a number of springs about and in this lake, including Steady, which are known as the Black Warrior Springs. The appellation "Black" was no doubt derived from the dark, manganese-tinted deposits and sediments. Near the shore these deposits are largely covered by the red algae.

Self-guiding leaflets similar to this one can be obtained at Fountain Paint Pots, Biscuit Basin and Old Faithful.

For further information inquire of a Park Ranger, or at the Old Faithful Visitor Center. Here you will be able to obtain additional literature on the hot springs and other aspects of the Park.

The printing of this folder for your convenience has been made possible by the Park Superintendent and members of the Interpretive Division of Yellowstone. If you wish you may keep this folder. However, if it bears no further value to you, kindly deposit it in the container near the parking area in order that others may use it.

Thank you!

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